



LM-79-08 Test Report

for

REVOLUTION LIGHTING TECHNOLOGIES, INC

2280 Ward Ave Simi Valley, CA 93065

Canopy Luminaires

Model: 111072-3X2

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18040033i/R1

This report is replaced the old report No. HZ18040033i dated Apr. 20, 2018.

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Reviewed by:

Engineer: April Zou
Apr. 27, 2018

Approved by:



Manager: Jim Zhang
Apr. 27, 2018

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Sample Tested: **111072-3X2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
114.8	4616.8	40.22	0.9849
CCT (K)	CRI	Stabilization Time (Light & Power)	
4028	76.3	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Mar. 05, 2017

Date of Test : Mar. 06, 2017

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

Reference Standard : IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

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Sample Photo

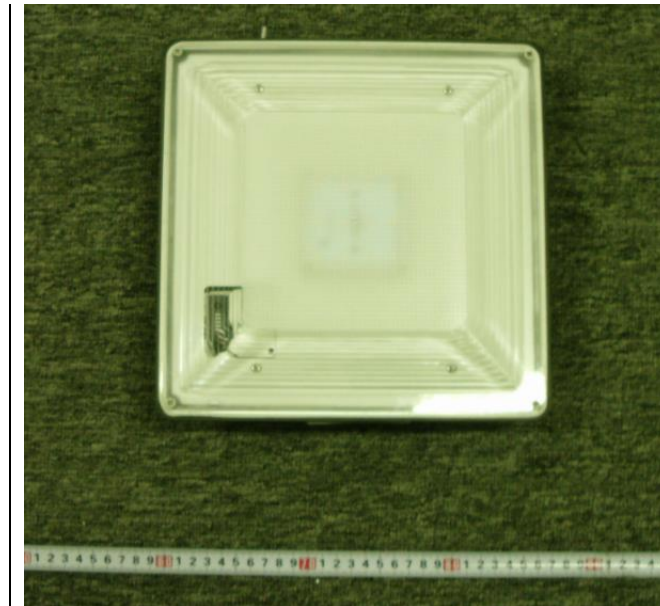


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Canopy Luminaires
Model	: 111072-3X2
Electrical Ratings	: 347~480V, 60Hz, 40W
Product Description	: 4000K Manufacturer of the LED light source: Nichia Corporation Model of the LED light source: NF2L757GRT-V1
Manufacturer	: REVOLUTION LIGHTING TECHNOLOGIES, INC
Address	: 2280 Ward Ave Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.6°C.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 85 minutes.

The photometric distance of Goniophotometer is 2.47 m.

Luminous data was taken at 0.5° vertical intervals and 10.0° horizontal intervals.

Parameter	Result	
Test Voltage (V)	347.0	480.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.118	0.088
Power Factor	0.9849	0.9575
Test Power (W)	40.22	40.47
THD A%	4.62	6.74
Luminous Efficacy (lm/W)	114.8	113.7
Total Luminous Flux (lm)	4616.8	4603.7
Color Rendering Index (CRI)	76.3	
R9	-23	
Correlated Color Temperature (CCT) (K)	4028	
Chromaticity (Chroma x, Chroma y)	(0.3781, 0.3719)	
Chromaticity (Chroma u, Chroma v)	(0.2255, 0.3327)	
Chromaticity (Chroma u', Chroma v')	(0.2255, 0.4991)	
Duv	0.0016	
Average Beam Angle (°)	161.4	
Center Beam Candle Power (cd)	1088	
Spacing Criteria	1.35 (0°-180°)/ 1.33 (90°-270°)	
Zonal Lumens in the 0°-60° Zone	59.28%	
Zonal Lumens in the 60°-90° Zone	36.74%	
Zonal Lumens in the 90°-120° Zone	3.87%	
Zonal Lumens in the 120°-180° Zone	0.11%	

Special Color Rendering Indices	
R1	73
R2	85
R3	93
R4	73
R5	73
R6	79
R7	81
R8	53
R9	-23
R10	65
R11	69
R12	52
R13	76
R14	96

Table 2: Test data per Goniophotometer Method

Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Spectral Power Distribution

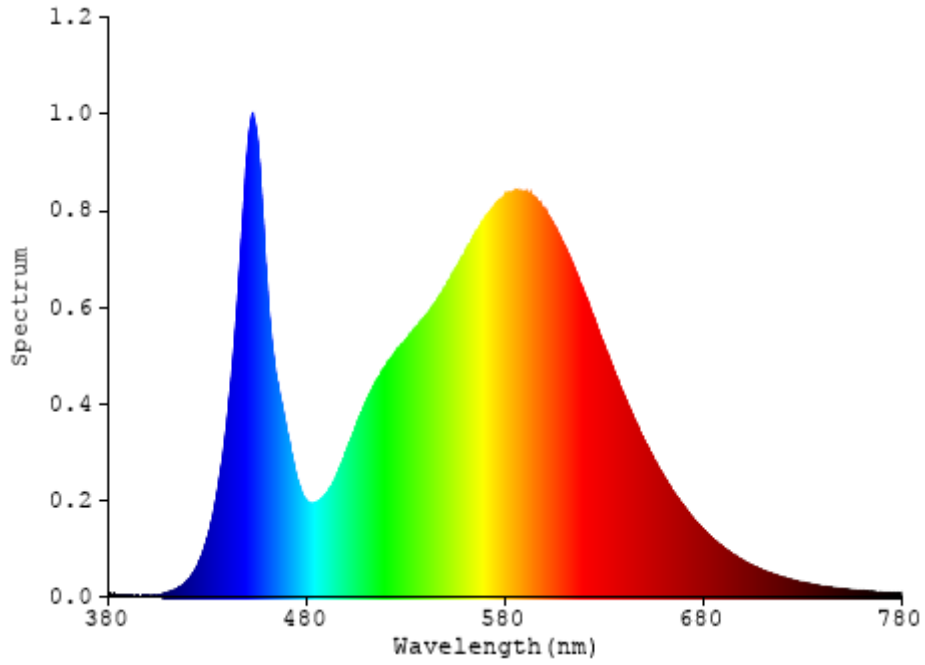


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	103.58	2.24%
10- 20	302.298	6.55%
20- 30	471.98	10.22%
30- 40	589.89	12.78%
40- 50	640.6	13.88%
50- 60	628.636	13.62%
60- 70	615.058	13.32%
70- 80	735.352	15.93%
80- 90	345.953	7.49%
90-100	137.6	2.98%
100-110	31.889	0.69%
110-120	8.991	0.19%
120-130	2.959	0.06%
130-140	0.716	0.02%
140-150	0.518	0.01%
150-160	0.408	0.01%
160-170	0.263	0.01%
170-180	0.092	0.00%
Total	4616.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2736.984	59.28%
60- 90	1696.363	36.74%
0-90	4433.347	96.03%
90- 180	183.436	3.97%
0- 180	4616.8	100%

Table 3: Zonal Lumen Data

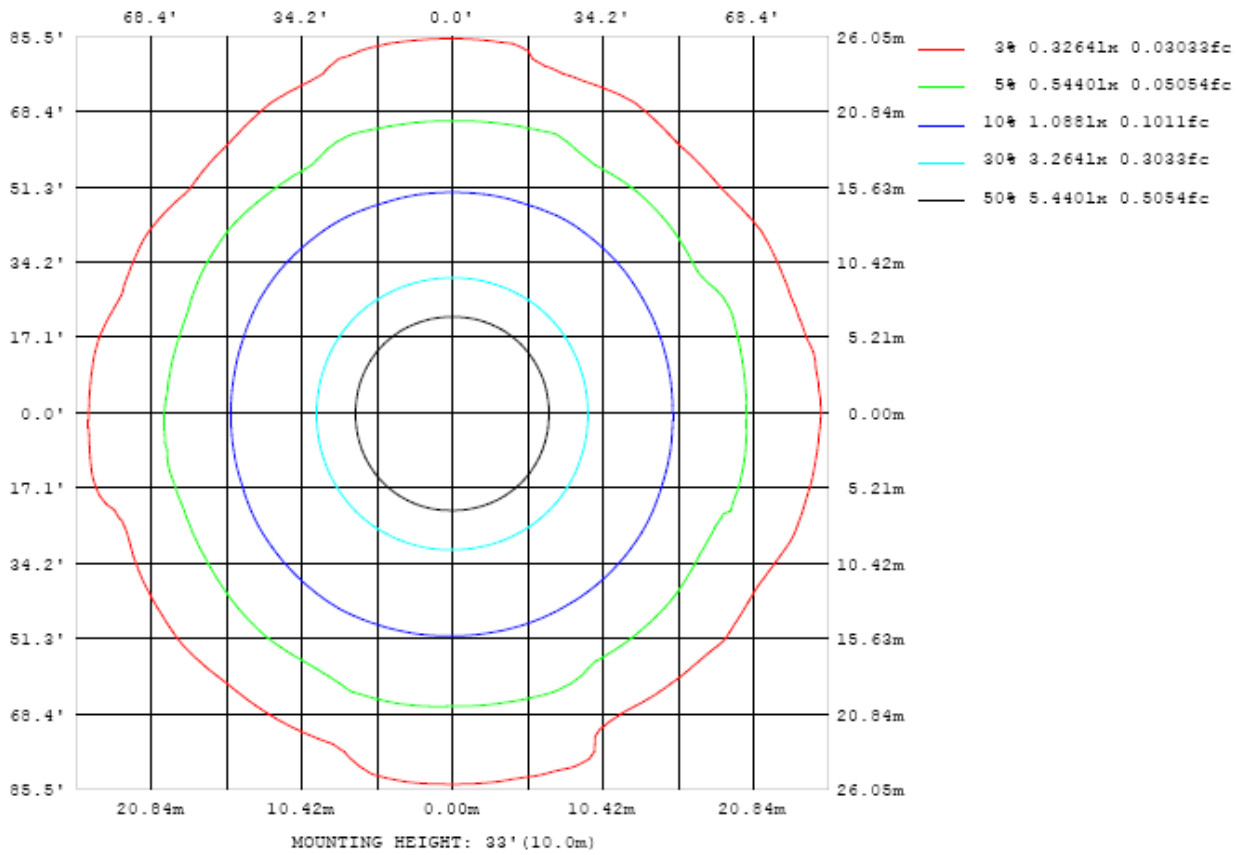


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

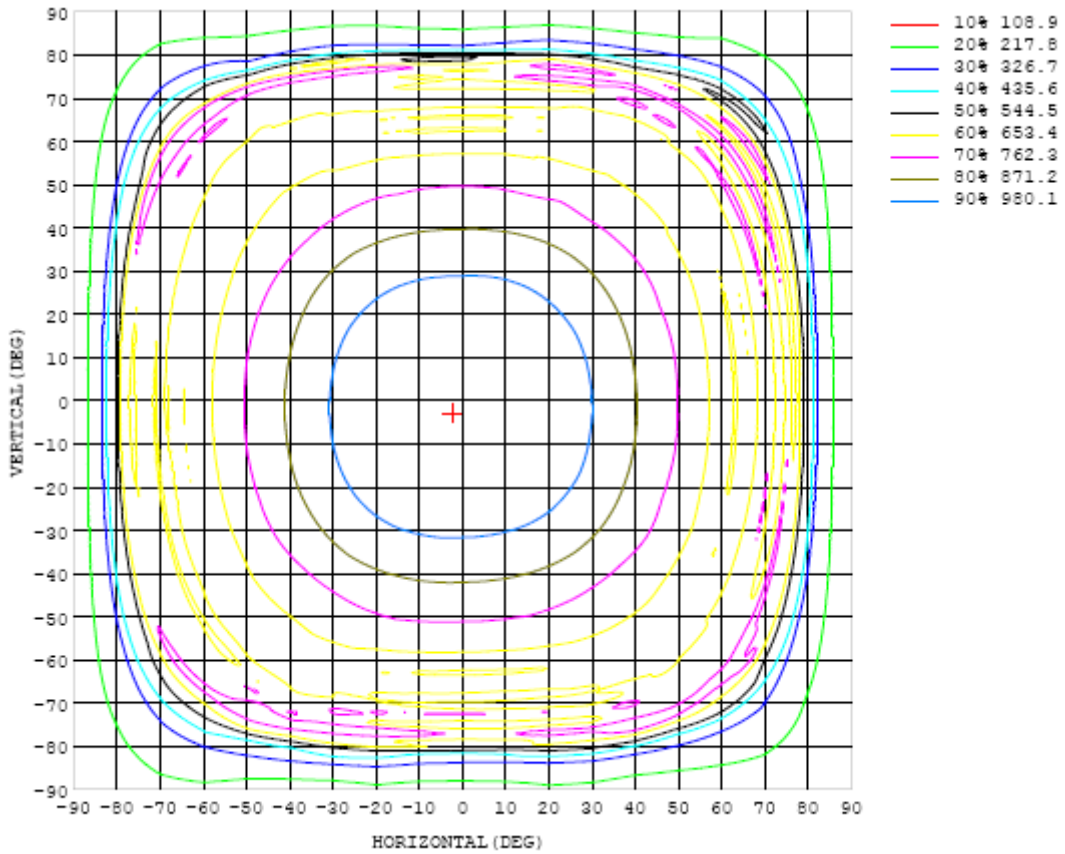


Chart 3: Isocandela Plot

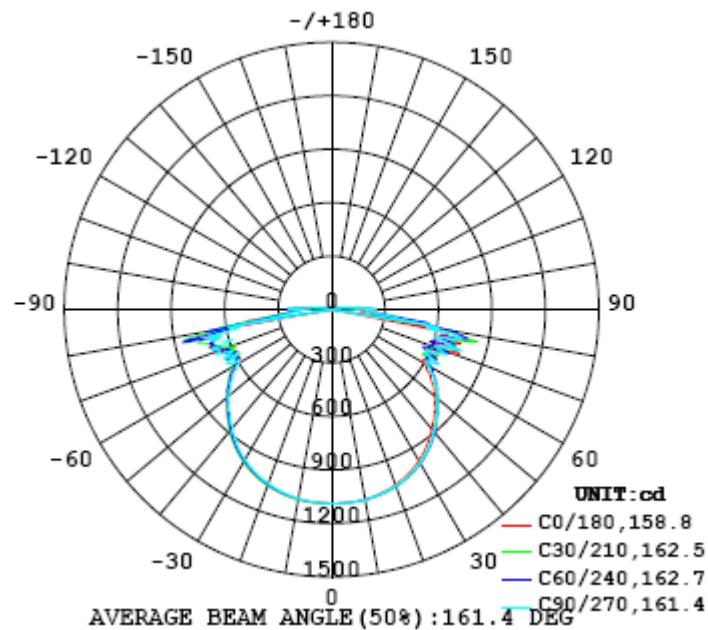


Chart 4: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088
5	1087	1087	1087	1087	1087	1088	1088	1088	1088	1088	1088	1088	1088	1089	1088	1088	1089	1088	1087
10	1081	1081	1082	1083	1084	1084	1084	1083	1083	1084	1084	1085	1085	1086	1085	1084	1084	1083	1083
15	1067	1068	1070	1072	1073	1074	1074	1073	1073	1073	1074	1075	1076	1076	1075	1074	1072	1071	1070
20	1047	1047	1051	1054	1055	1057	1057	1057	1055	1055	1057	1060	1060	1059	1059	1057	1055	1052	1051
25	1017	1019	1024	1027	1030	1032	1032	1031	1029	1029	1032	1034	1036	1036	1035	1032	1029	1025	1023
30	979	983	987	993	996	998	997	996	994	993	997	1000	1003	1004	1002	999	995	989	987
35	932	936	941	948	952	954	953	951	950	949	953	957	960	961	959	956	950	944	941
40	875	879	887	894	899	902	900	897	895	894	899	904	909	911	909	903	897	889	885
45	815	819	829	833	839	841	840	839	835	834	839	847	847	851	849	842	838	834	828
50	759	765	765	772	771	776	782	775	781	781	783	783	786	783	785	780	776	773	770
55	681	686	702	708	708	711	713	716	703	703	712	721	731	721	718	718	713	700	695
60	598	611	618	648	651	649	644	628	633	631	638	637	666	663	664	653	627	621	618
65	606	611	640	593	585	580	650	594	589	595	601	635	607	611	596	611	632	647	643
70	684	675	693	638	577	600	687	646	639	635	655	661	629	610	586	687	700	703	704
75	747	730	707	690	689	783	666	636	607	595	620	636	759	694	766	755	727	692	691
80	473	509	557	621	627	693	670	671	619	611	666	724	711	701	720	664	647	558	519
85	225	243	286	266	264	271	294	299	275	272	287	327	324	322	322	328	313	272	261
90	180	189	207	198	202	196	216	216	200	193	202	211	193	196	190	200	198	186	172
95	123	122	117	93.0	97.1	103	121	158	163	161	161	156	127	104	115	148	152	140	122
100	68.6	67.4	66.3	50.9	41.2	49.4	63.5	78.9	78.6	77.8	77.5	71.6	54.9	45.8	51.2	61.3	78.6	77.6	77.9
105	31.2	30.1	25.0	18.9	13.0	14.3	23.4	32.3	35.6	35.9	34.2	28.4	18.9	11.8	15.1	24.4	34.3	36.9	36.7
110	12.7	12.1	11.0	9.60	9.61	10.1	10.8	11.6	12.3	12.7	12.5	12.0	11.3	10.7	10.7	11.6	12.5	13.0	14.3
115	11.3	10.5	8.96	6.43	5.65	5.93	7.27	9.18	10.3	10.7	11.0	9.68	8.04	6.54	6.58	8.35	9.89	10.6	10.3
120	7.33	6.83	5.82	3.94	2.14	2.65	4.66	6.78	7.54	7.69	7.10	5.63	3.80	2.42	3.57	5.92	8.27	8.53	8.01
125	4.32	3.96	3.14	1.92	0.69	0.71	2.04	3.20	3.83	3.97	3.63	2.73	1.39	0.57	1.44	2.99	3.99	4.41	4.40
130	2.25	1.95	1.32	0.67	0.60	0.60	0.60	1.04	1.57	1.67	1.37	0.74	0.60	0.60	0.59	0.84	1.87	2.25	2.25
135	0.78	0.66	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.77
140	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.66	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.87
145	0.70	0.70	0.71	0.71	0.71	0.71	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.71	0.71	0.70	0.71	0.71	0.95
150	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	1.00
155	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.73	0.72	0.72	0.73	0.72	1.03
160	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.76	0.75	0.75	0.75	0.75	0.75	0.76	0.76	0.76	0.76	0.76	1.05
165	0.79	0.79	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.79	0.79	0.79	0.79	0.80	0.80	0.80	0.80	0.80	1.06
170	0.84	0.84	0.84	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	1.05
175	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.94	0.93	0.93	0.93	0.93	0.94	0.93	1.04
180	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97

Table 4: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088	1088		
5	1087	1087	1086	1086	1086	1085	1085	1085	1085	1085	1085	1085	1085	1085	1086	1086	1086		
10	1082	1081	1081	1080	1080	1079	1077	1077	1077	1077	1077	1079	1080	1079	1079	1080	1080		
15	1068	1069	1069	1068	1067	1065	1063	1062	1062	1062	1064	1065	1065	1066	1067	1067	1067		
20	1050	1050	1049	1048	1047	1045	1042	1040	1039	1040	1042	1044	1045	1046	1046	1046	1045		
25	1022	1022	1022	1021	1019	1016	1013	1010	1009	1010	1013	1015	1016	1017	1017	1017	1016		
30	986	986	987	986	984	981	976	972	971	973	976	979	981	981	981	980	978		
35	941	942	942	942	940	936	930	926	924	927	930	934	936	936	935	934	932		
40	886	887	890	890	888	882	875	869	867	870	875	880	884	884	881	878	874		
45	828	826	828	830	828	821	816	811	810	811	818	819	823	823	819	818	815		
50	766	771	764	760	762	763	760	757	753	760	753	765	756	756	761	759	760		
55	699	706	710	708	706	698	695	682	678	684	700	698	693	704	698	687	683		
60	620	629	643	654	646	631	614	612	606	611	611	643	647	639	618	614	600		
65	652	605	573	593	566	649	587	610	624	602	602	633	571	557	642	614	602		
70	704	666	626	596	612	688	690	671	670	676	705	617	639	654	656	707	687		
75	717	751	728	739	744	697	675	637	664	720	763	711	678	707	690	785	757		
80	551	628	620	614	659	697	662	605	583	593	658	630	561	566	530	501	471		
85	269	289	265	264	259	268	266	245	235	252	287	264	256	260	280	278	239		
90	180	184	183	177	175	177	180	172	170	176	184	180	162	173	187	184	176		
95	121	147	107	92.9	95.4	111	127	122	122	123	118	85.4	87.1	89.0	96.9	121	119		
100	74.8	66.3	49.0	42.3	45.3	62.2	73.2	72.6	71.7	71.1	65.5	47.3	38.5	39.5	56.0	68.3	70.3		
105	33.6	26.2	18.5	11.9	15.7	21.3	28.3	30.6	30.6	28.6	24.3	17.9	12.4	14.6	22.8	27.3	30.7		
110	12.5	12.1	11.1	11.0	11.0	12.4	13.1	13.3	13.0	12.5	11.3	10.4	10.0	9.74	10.8	12.3	12.8		
115	10.2	9.81	9.97	8.29	8.29	9.98	10.7	11.3	10.8	10.2	10.3	7.86	6.59	6.62	8.12	10.5	11.5		
120	7.43	6.14	4.41	3.93	4.58	6.53	8.99	9.80	9.86	7.49	5.93	4.21	3.31	3.54	5.01	6.53	7.45		
125	4.05	3.25	1.71	1.21	2.78	4.11	4.88	5.32	5.25	4.77	3.86	2.66	1.23	1.57	2.86	3.94	4.40		
130	1.88	1.08	0.68	0.68	1.24	2.32	3.04	3.41	3.36	2.94	2.25	1.29	0.69	0.68	1.27	1.97	2.34		
135	0.77	0.77	0.77	0.77	0.77	0.88	1.41	1.71	1.70	1.40	0.93	0.78	0.78	0.78	0.78	0.79	0.93		
140	0.87	0.87	0.87	0.87	0.87	0.87	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88		
145	0.95	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96		
150	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.02	1.01	1.01	1.01	1.01	1.01	1.02		
155	1.03	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04		
160	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.07	1.07		
165	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.07	1.06	1.07	1.07		
170	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.05	1.05	1.06	1.06	1.06	1.06	1.06	1.06	1.06		
175	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.04	1.05	1.05	1.05	1.05	1.05	1.05	1.05		
180	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	PF2010A	HZTE028-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-08	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	WY12010	HZTE004-03	Jul. 27, 2016	Jul. 26, 2017
Temperature Meter	TES1310	HZTE017-01	Jul. 27, 2016	Jul. 26, 2017
Standard Source	D908	HZTE012-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

Table 6: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.

Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.

Some graphics were created with Photometric Plus software.

The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

The uncertainty of goniophotometer system reported in this document is expanded uncertainty is 1.94% with a coverage factor $k=2$.

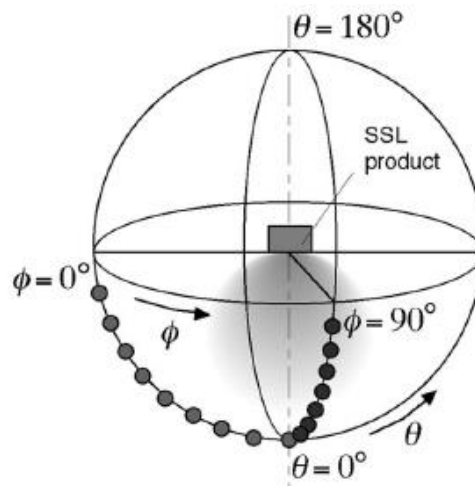
Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate was calculated from these points. The data was then analyzed to check for delta color differences of the u' , v' chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on the CIE (u' , v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***

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